

Thermochemical Modeling of Steel Making Process

Overview

Steel production and per capita consumption is directly linked to the prosperity of a nation. The Government of India is aiming to scale up steel production in the country to 300 MT by 2025 from 81 MT in 2013-14. (<http://www.ibef.org/industry/steel.aspx>). It is one of the major areas in national interest which is directly related to 'Make in India' program.

The steelmaking processes involve dynamic interactions among various phases (slag, metal and gas) along with chemical reactions, fluid flow and heat and mass transfer. Understanding of underlying basic principles of steelmaking helps to design, optimize and control the large scale industrial process of steelmaking in an effective manner. The course will consist of lectures in scientific base of steelmaking (Thermodynamics as well as kinetics) as well as application to the actual process by developing mathematical models employing a combination of commercial packages (like FactSage/METSIM/HSC/MATLAB). Overall the course will have following content: (a) Thermochemical equilibrium calculation (molten metal - slag - gas), reactions, energy and material balances, phase transitions in multicomponent systems, phase diagrams, introduction to software for the thermochemical equilibrium calculation (FactSage, HSC, METSIM). Calculation examples from the area of steelmaking converters, Electric arc furnace, Secondary Steelmaking, interface steelworks / blast furnace. Focus is on the application of thermochemical modeling on the subject-specific problems of steelmaking. (b) Basis of thermochemical calculations through various Example : Control of steel composition and temperature in converter steelmaking during blowing process, End point prediction and control ($T_{Melt} >> T_{End}$), Calculation of liquidus temperature, melting of different scrap in electrical arc furnace, Use of various scrap (coolant) in converter steelmaking process, Heat transfer in steel ladle and temperature prediction with and without lid, Influence of the cold ladle on the steel melt temperature, melting and dissolution rate of different alloys during steelmaking process, Composition and temperature control during secondary steelmaking, Inclusion Engineering, Change of chemical composition of pig iron with the temperature, Interface steel plant and blast furnace - temperature of pig iron, use of different alloys or slag bilinder in converter process, Phase diagram of slag systems and so on. Course participants will learn these topics through lectures and hands-on notes. Case studies and assignments will also be shared.

Dates for the Course	11th October, 2016 to 17th October, 2016
Host Institute	IIT Madras
No. of Credits	1
Maximum No. of Participants	100
You Should Attend If...	<ul style="list-style-type: none"> ▪ Shop floor engineers, managers, and R&D professionals working in the area of iron and steel production as well as non-ferrous extraction/production. ▪ Student or faculty from academic institution working in the area of process metallurgy/iron and steelmaking/metal extraction. ▪ Scientists and Engineers working in applied industrial based research organizations involved in the area of metal extraction and refining.
Course Registration Fees	<p>The participation fees for taking the course is as follows: Student Participants: Rs.1000 Faculty Participants: Rs.4000 Government Research Organization Participants: Rs.5000 Industry Participants: Rs.6000</p> <p>The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges.</p> <p>Mode of payment: Demand draft in favour of "Registrar, IIT Madras" payable at Chennai</p>
Accommodation	<p>The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel</p>

Course Faculty



Professor Dr.-Ing Olena Volkova is Head of Institute of Iron- and Steeltechnologie, TU Bergakademie Freiberg, Germany. A graduate from National Metallurgical Academy of Ukraine and doctorate from TU Bergakademie Freiberg, She has been extensively involved with applied industrial research and process development activities related to iron and steelmaking for over last 20 years. She also served as the Head of Level-2 and Optimization group at ThyssenKrupp Steel Europe and Project Manager at ThyssenKrupp Steel Brazil for many years. (<http://tu-freiberg.de/fakult5/iest/institut>)



Dr. Ajay Kumar Shukla, is Assistant Professor in the Department of Metallurgical and Materials Engineering, IIT Madras. He received his B.Tech and Ph.D. from IIT Kanpur. His research interests include process modeling, control and optimization of iron and steelmaking as well as non-ferrous extraction. He has spent almost one decade in steel industry at various managerial and technical capabilities (nine years in SAIL-Durgapur Steel Plant and almost one year at National Metallurgical Laboratory, Jamshedpur). He is currently involved with number of applied industrial research based projects with various steel plants.

Course Coordinator

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